The Skeleton

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Introduction

Our team decided to present the Research Topic 4 (the skeleton) because we considered that it was an interesting subject to analyse.

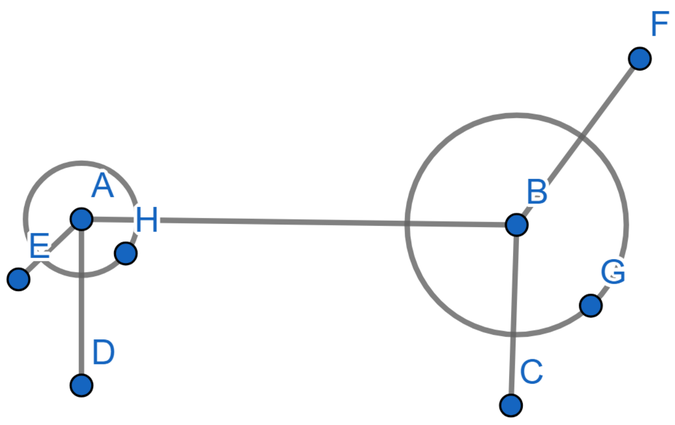
The problem itself

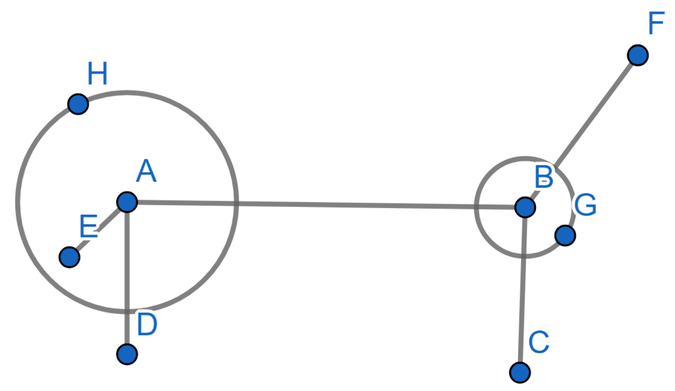
The biologist Harry Blum has introduced a new instrument that contributes to the shape's characterisation of individuals of the same species and to distiguish one species from another. The shape's skeleton S, named MA(S), is defined by the group of centres of the maximum spheres contained in S. What can you say abput the shape of the skeletons? Can we find a shape for a given skeleton?

Approaching the problem

We first drew a skeleton and filled it with circles in order to create a shape. Then we analyzed what the radius of the circles could be. We quicky got the 2 ideas: The first: we couldn't fill the shape with "spheres" of radius 0, as they would become points. The second: for a skeleton we can build an infinite number of shapes, by changing the radiuses of the spheres.

For a given skeleton	
Possible shapes	infinite
Actual shape	1





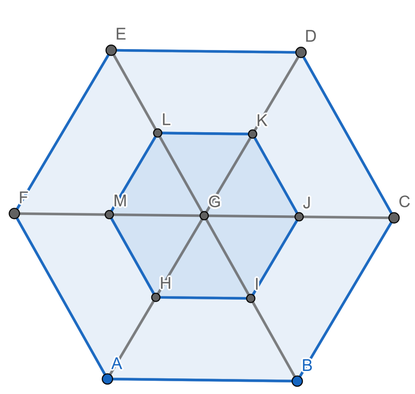
More Results

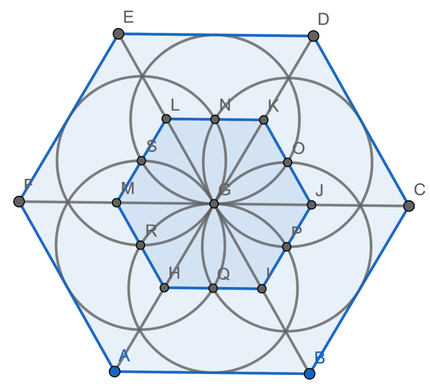
For a given shape, by applying the initial rule, there is only one posssible skeleton.

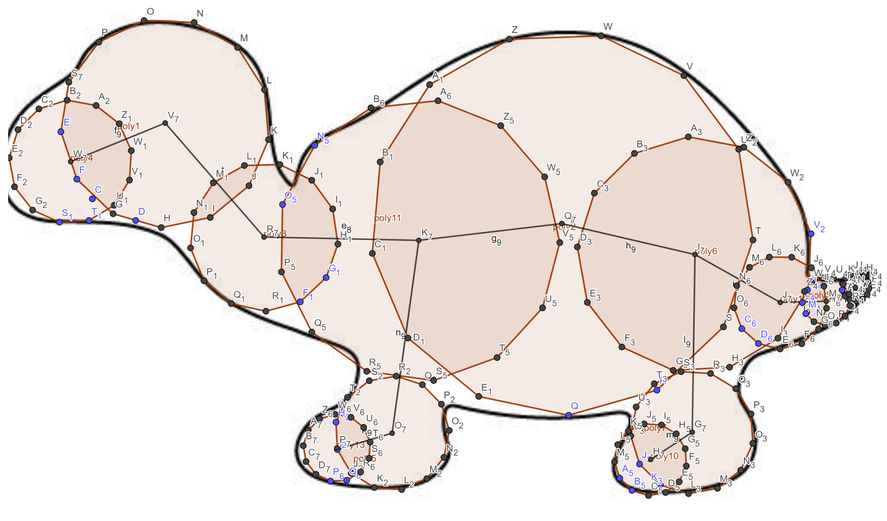
When reffering to drawing the skeleton, we were told we had to fill the shape with spheres of max radius, so we divided the shape into equal parts and then we filled those with poligons with as many sides as possible so it would ressemble a circle and it would fill the most space. We realised that there is only one possible shape for the skeleton.

For certain living things (eq. a camel), we will have ramifications that won't appear in the actual skeleton (the hump doesn't have bones).

The most practical method to represent the skeleton of a regulated polygon with an even number of sides is to construct the skeleton equally distanced from the figure's center and its' outline.







Conclusion

The problem wanted to test our ability of thinking outside the box and applying mathematics not in the old fashion. At the end, we demonstrated that we can find multipe shapes for a skeleton, that we can't use "spheres" with radius equal to 0, that we have to fill the shape with poligons similar to circles to fill as much space as we can and that there is only one possible skeleton for a shape.